

REMARKS

Favorable consideration of the application is respectfully requested. Claims 25-31, 33-38, 40-41, 43, 50-54 and 56, prior to this paper, were pending in the present application and claims 32, 39, 42, 44-49 and 55 were withdrawn from consideration.

By this paper, claims 25, 34, 40, and 50 are amended.

Claim Rejections - 35 U.S.C. §102

Claims 50, 52-54 and 56, prior to amendment, were rejected under 35 U.S.C. §102(b) as being anticipated by Wu (U.S. Patent No. 5,393,692).

Base claim 50 has been amended to recite:

“...forming a trench into a semiconductor substrate having a top surface;... planarizing said insulative material to approximately the same level as the top surface of said semiconductor substrate.”

The amended language further distinguishes the presently claimed invention from Wu. Support for the additional language is found in Figs. 1G and 2H, and page 6, second paragraph (lines 15-21) and on page 8, fourth paragraph (lines 19-26) of the present specification. Therefore, no new matter has been added.

Wu discloses in Figs. 7B and 11B field oxide region 63 having a smooth surface with a more planar topography than LOCOS and other prior art techniques provide (see column 5, lines 2-6). The process used in Wu to create the smooth and more planar surface of field oxide region 63 would not allow the creation of a planarized insulative material that is at approximately the same level of the semiconductor substrate's surface, a feature of the present invention as relied on for amendment.

In fact, if in Figs. 7B and 11B of Wu, field oxide region 63 extends above the level of the top surface of silicon substrate 20. Nowhere in Wu is it suggested that it would be possible or even desirable to planarized field oxide region 63 to the level of the top surface of silicon substrate 20, as currently claimed in the present invention.

In contrast to Wu, the present invention, as taught in the specification of the instant application, planarizing the isolation material to the same level as the top surface of the semiconductor substrate would add the distinct advantage of substantially reducing or possibly even eliminating any encroachment of the isolation material in the upper corners of the trench, (thus into the silicon substrate itself) which, as know to those skilled in the art, the encroachment could be detrimental to the size and operating characteristics of a final active device (see Figs. 1G and 2H, and page 6, second paragraph (lines 15-21) and on page 8, fourth paragraph (lines 19-26) of the present specification).

Clearly, Wu teaches away from the presently claimed invention of “forming a trench into a semiconductor substrate having a top surface...and planarizing the insulative material to approximately the same level as the top surface of the semiconductor substrate,” a feature of the presently claimed invention as relied on for amendment.

Thus, claim 50, as presently amended, is patentable over Wu, as well as the art of record and thus place dependent claims 51-54 and 56 as patentable over the art of record as well. Therefore, by amendment, the rejection of claims 50, 52-54 and 56, under 35 U.S.C. §102(b), as being anticipated by Wu (U.S. Patent No. 5,393,692), is overcome.

Claim Rejections - 35 U.S.C. §103

Claims 25, 27-31, 33, 34, 36-38, 40 and 43, prior to amendment, were rejected under 35 U.S.C. §103(a) as being as being unpatentable over Wu in view of Kameyama (U.S. Patent No. 4,472,240).

The rejection of claims 25, 27-31, 33, 34, 36-38, 40 and 43 under 35 U.S.C. §103(a) as being as being unpatentable over Wu in view of Kameyama (U.S. Patent No. 4,472,240), is respectfully traversed. However, claims 25, 34 and 40 have been amended to clearly distinguish the presently claimed invention from the art of record. Support for the additional language is found in Figs. 1D and 2D, page 5, second paragraph (lines 7-19) and on page 3, third paragraph (lines 13-25) of the present specification. Therefore, no new matter has been added.

Base claims 25, 34 and 40 have been amended to recite:

“...forming a...spacer on the sidewall of said first trench over and in direct contact with said single layer dielectric lining without removing a lateral portion of said single layer dielectric residing at the bottom of said first trench;

forming a second trench...at the bottom of said first trench by removing said lateral portion of said single layer dielectric while using said...spacer as an etching guide...”

The Examiner’s combination of Wu in view of Kameyama is respectfully traversed and the art is clearly not combinable as argued below.

Kameyama does teach the forming of a second trench into the substrate at the bottom of the first trench and as discussed previously, however it is not possible to combine the teachings

of Kameyama with Wu, absent the teachings of the present application. Wu discloses in Figs. 7 and 11, the use of etch stop layers 34 and 55, respectively, while Kameyama uses no such etch stop layer. The purpose of the etch stop layer in Wu is to stop an etch used to form spacers 38 or 58, with the etch stopping on the etch stop layer (either layers 34 or 55) and to prevent the etch from exposing the underlying silicon substrate (see Wu, column 4, lines 14-15 and column 5, lines 42-43 in conjunction with Figs. 7 and 11, respectively).

Conversely, Kameyama does not employ the use of an etch stop layer at the bottom of the first trench, nor do the teachings of Kameyama suggest the need or desire for the use of an etch stop layer at the bottom of the first trench (see Kameyama, column 4, lines 1-2, column 5, lines 57-59 and column 8, lines 46-49, along with Fig. 4D, 5D, and 10C, respectively).

Wu makes no suggestion of forming a second trench and Kameyama makes no suggestion of using an etch stop layer at the bottom of the first trench prior to the formation of the second trench. Clearly, there is no motivation found in either Wu or Kameyama, lacking the teaching of the present invention, to combine the teachings of Wu and Kameyama.

Clearly, the teachings of Wu and Kameyama are not combinable as the combination of Wu and Kameyama do not teach the presently claimed invention of “forming a...spacer on the sidewall of said first trench over and in direct contact with said single layer dielectric lining without removing a lateral portion of said single layer dielectric residing at the bottom of said first trench; forming a second trench...at the bottom of said first trench by removing said lateral portion of said single layer dielectric while using said...spacer as an etching guide,” a feature of the presently claimed invention as relied on for amendment.

Thus, base claims 25, 34 and 40, as presently amended, are patentable over the art of record and thus place their respective dependent claims 27-31, 33, 36-38, 40 and 43 and as patentable over the art of record as well. Furthermore, it is requested that the rejection of claims 25, 27-31, 33, 34, 36-38, 40 and 43, under 35 U.S.C. §103(a) as being unpatentable over Wu in view of Kameyama (U.S. Patent No. 4,472,240), be withdrawn.

Claim 51, prior to amendment, was rejected under 35 U.S.C. §103(a) as being unpatentable over Wu in view of Thomas et al. (U.S. Patent No. 4,922,318).

Base claim 50, as currently amended is deemed patentable over the art of record. The allowability of base claim 50 places dependent claim 51 as being patentable over the art of record as well. Therefore, the rejection of claim 51, under 35 U.S.C. §103(a) as being as being unpatentable over Wu in view of Thomas et al. (U.S. Patent No. 4,922,318), is now moot.

Claims 26, 35 and 41, prior to amendment, were rejected under 35 U.S.C. §103(a) as being unpatentable over Wu and Kameyama and further in view of Thomas et al. (U.S. Patent No. 4,922,318).

The Examiner's rejection of claims 26, 35 and 41, under 35 U.S.C. §103(a) as being unpatentable over Wu and Kameyama and further in view of Thomas et al. (U.S. Patent No. 4,922,318) is respectfully traversed.

As previously argued, the teachings of Wu and Kameyama are not combinable, thus rendering the teachings of Wu and Kameyama and further in view of Thomas et al. as being non-combinable as well. In that regard, it is requested that the rejection of claims 25, 27-31, 33, 34, 36-38, 40 and 43, under 35 U.S.C. §103(a) as being unpatentable over Wu in view of Kameyama (U.S. Patent No. 4,472,240), be withdrawn.

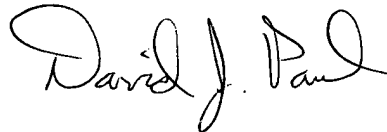
Furthermore, base claims 25, 34 and 40, as currently amended are deemed patentable over the art of record. The allowability of base claims 25, 34 and 40 place their respective dependent claims 26, 35 and 41 as being patentable over the art of record as well. Therefore, the rejection of Claims 26, 35 and 41, under 35 U.S.C. §103(a) as being as being unpatentable over Wu and Kameyama and further in view of Thomas et al. (U.S. Patent No. 4,922,318), if not withdrawn is now moot.

CONCLUSION

Applicant submits that the application is in condition for allowance. Such allowance at an early date is respectfully requested.

To that end, if the Examiner feels that a conference will expedite the prosecution of this case, the Examiner is cordially invited to call the undersigned.

Respectfully submitted,

A handwritten signature in cursive script that reads "David J. Paul". The signature is written in black ink and is positioned above the printed name and contact information.

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